EXPLANATION OF SIGNIFICANT DIFFERENCE
(OU3 – Final Groundwater)

To The Record of Decision
for the

McCormick and Baxter Creosoting Company Superfund Site
Portland, Multnomah County, Oregon

ORD009020603

August 2002

Prepared by:
Oregon Department of
Environmental Quality (DEQ)

Issued by: Date:

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Neil Mullane, Administrator
Northwest Region
Oregon Department of Environmental Quality

Concurred by: Date:

_____ _____

Michelle Pirzadeh, Associate Director
Office of Environmental Cleanup
U.S. Environmental Protection Agency

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I. INTRODUCTION

Site Name, Location, Physical Description and Land Use

The McCormick and Baxter Creosoting Company, Portland Plant Site (McCormick & Baxter Site or Site) is located at 6900 North Edgewater Street on the northeast bank of the Willamette River in Portland, Oregon (Figure 1). The Site is downstream of Swan Island and upstream of the St. John's Bridge. The Site covers approximately 43 acres of land and 15 acres of sediment in the Willamette River (Figures 2 and 3). The Site is currently vacant, except for groundwater treatment systems located in the Central Processing Area (CPA) and Former Waste Disposal Area (FWDA). A storage tank (part of the groundwater treatment system) is located in the Tank Farm Area (TFA), a shop building housing the treatment system is located in the CPA, and two office trailers are located in the parking lot north of the central processing area.

The Willamette River flows to the northwest in the vicinity of the site. The site is located in an area that was constructed by placement of dredged material in the early 1900s. The site is generally flat and lies between a 120-foot-high bluff near the northeastern border and a 20 foot-high bank along the Willamette River to the southwest. A sandy beach is exposed at the base of the bank, except during brief periods of high river stage (i.e., generally during late winter or early spring).

Land use at the site has been industrial since the 1940s, although the site has been vacant since 1991. The site is bordered to the northwest and southeast by inactive industrial properties, also located on the Willamette River. A residential area is located along the top of the 120-foot-high bluff to the northeast. The inactive industrial property to the northwest recently was purchased by the local government for conversion to a riverfront natural area (i.e., greenspace).

Between February 2000 and April 2001, an EPA-funded advisory committee known as the McCormick and Baxter Site Reuse Advisory Committee worked toward an agreement on reuse recommendations. Although the advisory committee's primary recommendation suggested that the site be used as a park and riverfront natural area, the committee did not reach consensus as to whether the use should be for an interim period or on a permanent basis. The City of Portland Bureau of Planning used the advisory committee's framework to finalize the recommendations, and supported a permanent park to accommodate active and passive recreation. On July 25, 2001, the Portland City Council adopted Resolution No. 36010, which endorsed the bureau's recommendations. The resolution further directed the Bureau of Planning to prepare a feasibility study to evaluate the costs and benefits of acquiring and developing the site as a park. In the course of the development, as stated in the resolution, the Council envisioned use of the site as a riparian buffer to enhance natural resource values while affording opportunities for environmental education.

Lead and Support Agencies

The Oregon Department of Environmental Quality (DEQ) is the lead agency for this Superfund Site and the United States Environmental Protection Agency (EPA) is the support agency. Technical support is primarily provided by DEQ's contractor Ecology & Environment, Inc. (E&E). The primary team members include Kevin Parrett (the DEQ Project Manager), Alan Goodman (the EPA Remedial Project Manager), and John Montgomery (the E&E Project Manager).

Statutory Citation for an Explanation of Significant Difference

The Explanation of Significant Difference (ESD) describes the rationale for implementing the contingency groundwater remedy specified in the Record of Decision (ROD) for the McCormick & Baxter Site. Section 117(c) of CERCLA, 42 USC §9617(c), and the National Contingency Plan (NCP), 40 C.F.R. Section 300.435(c)(2)(i) require that an ESD be prepared when the differences in the remedial action significantly

change but do not fundamentally alter the remedy selected in the ROD with respect to scope, performance or cost. It is EPA's policy to prepare an ESD prior to implementation of a contingency remedy (*Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*, EPA 540-R098-031, 1999).

Date of Record of Decision

The ROD for the McCormick & Baxter Site was issued in March 1996. It was signed on March 29, 1996 by EPA and on April 4, 1996 by DEQ. A ROD Amendment was issued in March 1998 to allow off-site disposal of contaminated soil. EPA signed the ROD Amendment on March 17, 1998 and DEQ signed it on March 20, 1998.

The ROD specified the cleanup remedies for four operable units consisting of soil (OU1), interim groundwater (OU2), final groundwater (OU3) and sediment (OU4). This ESD addresses OU3 which is the final groundwater operable unit. The status of remedy implementation and performance for all four operable units is provided in the *First Five-Year Review Report* for the McCormick & Baxter Site dated September 2001.

Administrative Record

This ESD is supported by and, when issued, will become part of the Administrative Record file for this Site, in accordance with the NCP, Section 300.823(a)(2). The Administrative Record is available for review at DEQ's Northwest Regional Office located at 2020 Southwest Fourth Avenue (4th Floor) in Portland, Oregon. Key documents and reports are also available for review at the St. John's Community Library located at 7510 North Charleston Street in Portland, Oregon and at the North Portland Neighborhood Office located at 2209 N. Schofield in Portland, Oregon.

II. BACKGROUND

Circumstances Prompting a Change in the Selected Groundwater Remedy

The remedy selected in the ROD for the final groundwater operable unit includes a contingency for installing an impermeable subsurface barrier wall in the event that either i) oily chemical wastes called non-aqueous phase liquid (NAPL) cannot be reliably contained using hydraulic methods or ii) the barrier wall improves the overall cost-effectiveness of the groundwater remedy. DEQ and EPA have determined that NAPL has not been contained using groundwater/NAPL extraction and NAPL recovery measures employed to date. The basis for this conclusion is discussed in the following sections of this ESD.

The ROD also requires that placement of a sediment cap as the remedy for the sediment operable unit shall not occur until the selected groundwater remedy has been implemented and after DEQ and EPA have determined that adequate control of NAPL has occurred, to ensure that recontamination of the sediment will not occur. Since the sediment cap is under design now and tentatively planned for construction in late 2003, the groundwater remedy contingency barrier wall needs to be proceed at this time to achieve NAPL control.

Summary of Site History and Groundwater Contamination

The McCormick & Baxter Creosoting Company operated between 1944 and 1991 and, treated wood products with creosote, pentachlorophenol, and inorganic (arsenic, copper, chromium and zinc) preservative solutions. Historically, process wastes were disposed of in several areas of the Site, including the FWDA. In addition, there were periodic spills and leaks of wood-treating chemicals in the TFA and CPA. Significant concentrations of wood-treating chemicals are now present in groundwater beneath the Site. The contamination is found in three different forms: contaminants dissolved in groundwater (aqueous phase), oily contaminants that are lighter than groundwater and therefore tend to float (LNAPL) and oily contaminants that are denser than groundwater and therefore tend to sink (DNAPL).

Two distinct NAPL plumes exist beneath the Site, one extending from the TFA into the Willamette River and one extending from the FWDA into the Willamette River and Willamette Cove, a shallow inlet located immediately downstream of the Burlington Northern Railroad bridge (see Figure 4). The plumes contain mobile LNAPL and DNAPL, as well as residual NAPL in soil. Mobile NAPL is present from approximately 20 to 80 feet below ground surface (bgs). Regional groundwater flow is toward the river. However, localized reversals of site groundwater gradients have been recorded (particularly in the FWDA) during seasonal high river stages and flood events.

DEQ conducted investigations at the Site between September 1990 and September 1992, and issued a proposed cleanup plan in January 1993. However, a final ROD was not issued at that time, due to the pending listing of the Site on EPA's National Priorities List (NPL or "Superfund List"). The Site was placed on the NPL on June 1, 1994. In the interim, DEQ implemented a number of removal actions including plant demolition, sludge and contaminated soil removals, and initiated extraction of NAPL product (primarily creosote) from the groundwater aquifers.

DEQ issued a revised Feasibility Study in September 1995, and DEQ and EPA issued a Proposed Cleanup Plan in October 1995. The ROD was issued jointly by DEQ and EPA in April 1996.

Groundwater Remedial Action Objectives and Selected Remedy

The ROD specified the Remedial Action Objectives (RAOs) for groundwater and NAPL contamination at the Site as:

- Preventing human exposure to or ingestion of groundwater with contaminant concentrations in excess of Federal and State drinking water standards or protective levels;
- Minimizing further vertical migration of NAPL to the deep aquifer;
- Preventing groundwater discharges to the Willamette River that contain dissolved contaminants that would result in contaminant concentrations within the river in excess of background concentrations or in excess of water quality criteria for aquatic organisms;
- Minimizing NAPL discharges to the Willamette River beach and adjacent sediment to protect human health and the environment; and
- Removing mobile NAPL to the extent practicable to reduce the continuing source of groundwater contamination and potential for discharge to Willamette River sediment.

Because of the extensive NAPL contamination, DEQ and EPA determined that it is not technically practicable to restore the groundwater aquifers under the Site to drinking water quality; therefore, site-specific groundwater contaminant concentration limits that are protective of the environment were developed and specified in the ROD. These protective alternate concentration limits (ACLs) were developed in accordance with CERCLA Section 121(d)(2)(B)(ii) for dissolved contaminants in groundwater discharging to the Willamette River. Section 121 provides that ACLs may be used at a Superfund Site when:

- There are known and projected points of entry of the contaminated groundwater into surface water;
- On the basis of measurements or projections, there is or will be no statistically significant increase of contaminants from the groundwater into surface water at the point of entry or at any point where there is reason to believe accumulation of constituents may occur downstream; and
- The remedial action includes enforceable measures that will preclude human exposure to the contaminated groundwater at any point between the facility boundary and all known and projected points of entry of the contaminated groundwater into surface water.

Dissolved-phase groundwater contamination in the shallow aquifer at the Site is associated with NAPL plumes migrating from the TFA and FWDA. The ROD specified groundwater ACLs for total PAHs at 43 milligrams per liter (mg/L), PCP at 5 mg/L, dioxins/furans at 2×10^{-7} mg/L and arsenic, chromium, copper, and zinc at 1 mg/L each. These values were generally derived from aqueous solubility limits and groundwater/surface water dilution.

In order to achieve the RAOs, the final groundwater remedy consists of the following major elements:

- Enhancing NAPL recovery using pure-phase extraction and/or groundwater/NAPL extraction;
- Evaluation by pilot testing of innovative technologies, such as surfactant flushing, to increase the effectiveness and the rate of NAPL removal;
- Treatment of groundwater (wastewater) using methods such as dissolved air flotation, filtration, carbon absorption, extended aeration/packed bed bioreactor, or other biological treatment;
- Discharging of treated groundwater (wastewater) to the Willamette River in accordance with substantive NPDES requirements, or alternatively discharge to drainfields installed in major source areas for enhanced NAPL recovery if pilot testing is successful;
- Off-site treating and/or disposing of NAPL and other treatment residuals in accordance with applicable hazardous waste regulations;
- Monitoring to ensure that site-specific ACLs are met at compliance monitoring locations;
- *A contingency to install a vertical physical barrier in the event that:*
  - *The mobile NAPL cannot be reliably controlled using hydraulic methods; or*
  - *It improves the overall cost-effectiveness of the groundwater remedy*; and
- Installation of institutional controls that restrict groundwater use at the Site.

As discussed in the following sections of this document, hydraulic control of NAPL has not been established in the TFA and FWDA as evidenced by continued NAPL discharges into the Willamette River. Consequently, DEQ and EPA have concluded that implementation of the barrier wall contingency is necessary in order to achieve the RAOs established in the ROD and to meet the criteria provided in CERCLA for establishing ACLs at this Site.

III. BASIS FOR IMPLEMENTATION OF THE CONTINGENCY REMEDY

Subsequent Events and New Information Since Issuance of the ROD

The enhanced NAPL recovery system specified in the ROD was constructed through upgrades and enhancements to an interim groundwater treatment system initiated in 1994 and operating at the time the ROD was issued. The enhanced system consisted of total fluids extraction in the TFA and pure-phase NAPL extraction in the TFA and FWDA. Wells were pumped until visible oil was not present in the discharge, then allowed to recover before resumption of pumping.

A pilot-scale wastewater treatment system was installed at the Site in 1994 in an effort to separate NAPL and treat groundwater removed through total fluid extraction efforts in the TFA. The NAPL/groundwater mix was conveyed to the pilot-scale wastewater treatment system and treated by dissolved air flotation (DAF). Treated wastewater was discharged to the Willamette River.

The total fluids extraction system and the DAF system were prone to shutdowns, required extensive technician oversight and was expensive to operate. To allow for continuous removal and to reduce costs and operator requirements, the total fluids extraction system was replaced in 1998 with a combination manual and automated skimming system. NAPL and wastewater generated by this system were treated utilizing an oil/water separator, an in-line anthracite/clay filter, two granular activated carbon (GAC) units, and a metals treatment unit.

By mid-2000, it became apparent that the volume of NAPL extracted by the automated skimming system was not significantly greater than the volume removed by the manual system and the automated skimmer system also was prone to malfunction. In addition, the operating cost of the automated skimming system was approximately twice as high the operating cost of the manual system. In September 2000, the automated NAPL extraction system in the FWDA and TFA was shutdown and replaced with a manual system. Currently, NAPL extraction at the Site includes manual LNAPL skimmers in select monitoring wells and manual LNAPL and DNAPL extraction using pneumatic pumps.

The total volume of NAPL extracted from groundwater during the five year period between 1996 and 2001 was 1,850 gallons. The cost to construct and operate the NAPL extraction system(s) during this period was approximately $1.5 million, excluding DEQ and EPA oversight costs. This corresponds to an average cost of approximately $800 per gallon of recovered NAPL.

Routine measurement of NAPL thickness, semiannual sampling of groundwater and inspections of historic NAPL seeps in the Willamette River and Willamette Cove continue to be conducted at the Site. These measurement, data and observations clearly indicate that efforts employed to date to contain NAPL by hydraulic methods have not succeeded in preventing the discharge of NAPL from the Site to the Willamette River and its sediment. For example:

- Several monitoring wells downgradient from the FWDA and TFA continue to show LNAPL thickness of several feet;
- NAPL seeps on the beach downgradient from the FWDA have been observed consistently during low river stages in late summer and early fall for the past several years;
- Extensive NAPL seeps have been observed in the Willamette Cove during the spring and summer of 2001, coinciding with a regional drought in which rainfall was 64 percent of normal between January 2001 and October 2001; and
- Groundwater flow gradients toward the river have been measured, as documented in past quarterly and semiannual reports, indicating that the FWDA and TFA are the primary sources of the NAPL seeps.

Based on these observations DEQ and EPA have concluded that hydraulic control of NAPL or groundwater has not been established in either the TFA or the FWDA.

Supporting Information

This ESD is based on information collected and developed since the ROD was issued in 1996. This information is contained in the Administrative Record for the McCormick & Baxter Site. The primary documents referenced in this ESD include:

- *Remedial Actions Semiannual Report*, prepared by E&E for the DEQ, through February 2002.
- *First Five-Year Review Report*, issued by DEQ with concurrence by EPA, September 2001.
- *Barrier Wall Focused Technology Evaluation*, prepared by E&E for the DEQ, September 2001.
- *Draft Groundwater Modeling Report*, prepared jointly by E&E and DEQ, August 2001.
- *Record of Decision*, issued by DEQ and EPA, March 1996.
- *Letter to DEQ and EPA from NOAA*, January 28, 2002.
- *Letter to DEQ and EPA from Confederated Tribes of Grand Ronde*, January 2002.
- *Letter to DEQ and EPA from NOAA*, May 2, 2002.
- *Letter from EPA to NOAA*, May 17, 2002.
- *Letter from EPA to Confederated Tribes of Grand Ronde*, May 17 2002.
- *Biological Assessment*, prepared by DEQ, May 2002.

IV. DESCRIPTION OF THE SIGNIFICANT DIFFERENCE

Implementation of the Contingency Remedy for the Final Groundwater OU

The ROD identified a subsurface barrier wall as a contingency measure for the final groundwater operable unit at the McCormick & Baxter Site. Implementation of this contingency measure is to occur if either of the following two conditions are met:

- The mobile NAPL cannot be reliably controlled using hydraulic methods; or
- The barrier wall improves the overall cost-effectiveness of the groundwater remedy.

Based on the information provided in the previous section of this document, DEQ and EPA have concluded that mobile NAPL has not been controlled at the Site and implementation of the barrier wall contingency is justified.

Barrier Wall Alternatives Considered

In order to determine the best alignment and construction technique for the barrier wall, several alternatives were evaluated for their effectiveness, implementability and cost. The results of this evaluation are provided in the *Barrier Wall Focused Technology Evaluation* report. Four general alignments were considered in this evaluation and are shown in Figure 5. Alternative 1 is described as an "upland alignment" forming a partially encompassing (i.e., semi-circular) wall extending downgradient of the TFA and FWDA. Alternative 1 is located on the flat, upland portion of the site and does not extend down the riverbank. Alternative 2 is described as a "partial riverfront" alignment. It is similar to Alternative 1 except that the segment of the wall downgradient of the FWDA extends down the riverbank and runs along the ordinary high water mark of the Willamette River then turns back up the riverbank prior to the TFA. Alternative 3 is described as an "in water" alignment extending under the railway bridge and into Willamette Cove. This alternative, as with alternatives 1 and 2, forms a semi-circle around the FWDA and TFA. Alternative 4 is described as a "fully encompassing" alignment. It is similar to Alternative 1 except that it completely encloses the FWDA and TFA in a fully circular wall.

The *Barrier Wall Focused Technology Evaluation* concluded that the alternatives are readily implementable, with the exception of the "in water" alignment (Alternative 3) extending into Willamette Cove. Although the "in water" alignment would capture more NAPL and further minimize the "wedge" of NAPL located outside the alignments of the other alternatives, the "in-water" alignment would require the wall to extend above the river level to at least the ordinary high-water mark in order to prevent LNAPL from flowing over the wall

during periods of high river level. This wall extension would create a bulkhead within the Willamette River. This in-water bulkhead would result in a loss of flood conveyance of the Willamette River and subsequent impact upon the floodplain. An in-water bulkhead is also expected to have adverse impacts on aquatic and riparian habitat. Furthermore, extending an "in-water" barrier wall into Willamette Cove would require the wall to cross a City of Portland high pressure sewer main located adjacent to the FWDA and cross under the railway bridge also located adjacent to the FWDA. These circumstances present significant construction obstacles, making this wall alignment impractical.

The *Barrier Wall Focused Technology Evaluation* concluded that the "partial riverfront" alignment would capture more NAPL than the other readily implementable alternatives. Furthermore, the technology evaluation concluded that the "fully encompassing" alignment would provide additional benefits by minimizing the effects of groundwater flow through the FWDA and TFA and by eliminating concerns of potential NAPL migration around the perimeter of a partial wall alignment. The capital costs for the alternatives range from approximately $2 million to $5 million and were primarily influenced by the length of the wall and the extent of steel sheet pile that would be used versus less expensive bentonite-soil slurry construction. Additional construction costs and uncertainties were associated with the "in-water" alignment.

Selected Barrier Wall Alignment

The barrier wall alignment selected by DEQ and EPA is a modified combination of Alternatives 2 and 4. The selected alignment is a "complete riverfront" alignment with the downgradient segment located along the ordinary high-water mark of the Willamette River. The barrier wall also is a "fully encompassing" alignment constructed around the TFA and the FWDA. The barrier wall will be a subsurface installation with no part of it visible above the ground surface. The wall alignment is shown in Figures 6 and 7. This barrier wall alignment is preferred by DEQ and EPA because it achieves the best balance of human health and environmental risk reduction, through containment of mobile NAPL, in a cost-effective and readily implementable manner, as compared to other alignment alternatives. This fully encompassing, complete riverfront alignment has several primary benefits over partially encompassing alignment alternatives. The fully encompassing alignment, in addition to capturing mobile NAPL, is expected to decrease the potential for adverse impacts to the river by reducing the quantity of groundwater passing through the primary NAPL source areas and discharging into the river. The fully encompassing alignment also eliminates potential NAPL migration around the perimeter of a partial wall alignment. The complete riverfront alignment contains more NAPL then other alternatives.

The total wall length will be approximately 3,645 linear feet. The depth of the wall will vary between 48 feet below ground surface (bgs) and 83 feet bgs to account for differences in topography and soil profile at the Site. The segment of wall around the TFA (approximately 1,175 linear feet) will be "keyed" into a silt layer aquitard (i.e., the bottom of the wall will physically extend a short distance into the aquitard) that underlies the shallow sand stratum. This segment will extend to a maximum depth of 73 feet bgs corresponding to 38 feet below Mean Sea Level (MSL). The segment of wall around the FWDA (approximately 1,115 linear feet) will be a "hanging" barrier because deeper soil in this area consists of interbedded sand and silt lenses with no continuous, competent aquitard to key into. The vertical hydraulic conductivity (K_v) of the silt aquitard is approximately 0.1 feet/day, whereas the K_v of the interbedded sand is approximately 2 feet/day (see *Draft Groundwater Modeling Report, August 2001*). The segment of the wall around the FWDA will extend to a maximum depth of 83 feet bgs (i.e., -48 feet MSL). The segment of the wall located upgradient of the TFA and FWDA (1,455 linear feet) will be keyed into the silt aquitard which occurs at a shallower depth in this area then in the TFA. The upgradient segment of the wall will extend to an approximate depth of 63 feet bgs (i.e., -28 feet MSL).

Although the barrier wall segment located downgradient of the FWDA does not key into a continuous, competent aquitard, this segment of the wall will be extended to such a depth that DNAPL migration toward the river will be substantially retarded. The -48 feet MSL depth of this segment of the barrier wall is below the river bottom within a distance of 400 feet. Beyond this near shore area, the general river depth drops to -50 feet MSL. Several deeper holes of -60 to -75 feet MSL are present beyond a distance of 700 feet from the barrier wall.

Selected Barrier Wall Construction

The barrier wall will be constructed using two common construction methods. Approximately 2,370 linear feet of wall will be constructed on relatively flat part of the site from soil-bentonite slurry. Interlocking steel sheet pile will be used in locations of the alignment where slurry construction is not feasible. Approximately 1,275 linear feet of sheet pile will be used along the riverbank, downgradient of the FWDA and TFA.

The soil-bentonite slurry wall will be constructed using a slurry trench method. In this method, soil along the wall alignment will be excavated with an extended-boom excavator. A treatability study has been performed to determine the amount of bentonite needed to achieve the desired permeability for the wall (i.e., 1×10^{-7} centimeters per second [cm/s]) and to determine whether contaminated soil could be used in the soil mixture. The treatability study concluded that a soil-bentonite slurry containing 5% bentonite achieved the desired permeability and that contaminated soil could be used in the soil-bentonite slurry as long as the bentonite was hydrated for at least 24 hours prior to mixing. The treatability study is provided in the *Barrier Wall Focused Technology Evaluation*. The bentonite-water slurry mixture, 5% bentonite and 95% water by weight, will be maintained in the trench to prevent trench collapse during excavation. Excavated soil will be blended with a bentonite/water slurry to form a soil-bentonite backfill mixture with the consistency of high-slump concrete. Soil with visually observable contamination (i.e., NAPL blibs or blobs) will be segregated from cleaner soil and not mixed with bentonite. The soil-bentonite backfill material then will be placed back into the trench. Slurry mixing typically is accomplished in a high-speed mixing plant. A water source capable of delivering up to 70 gallons per minute (gpm) on demand will be needed. The current Site water supply is capable of delivering 400 to 600 gpm. Backfill mixing could be accomplished along the side of the trench or in a remote mixing area. The width of the wall will depend on the type of equipment used for trenching. Slurry trench walls constructed with excavators to these desired depths are generally 2.5 to 3 feet wide in order to accommodate the boom of the excavator during trenching. Most of the equipment needed to construct the wall is conventional earth-moving equipment, though a special extended-boom excavator would need to be mobilized from outside of the Portland area. The materials and labor required for the wall also can be obtained readily. With the exception of the sloping topography downgradient of the FWDA and TFA (to be constructed with steel sheet pile), the unobstructed conditions and relatively flat topography of the Site are conducive to the space requirements needed for trenching and backfill mixing.

Installation of a steel sheet pile wall typically is performed by a driven or vibratory method. Vibratory hammers likely will be used to drive the sheets part of the way, if not all of the way, to the desired depths. An impact hammer will be used to complete the sheet pile installation if vibratory methods are insufficient. The steel sheets are usually 4 feet wide with various patented interlocking joint types. The presence of gravel, rock or stiff silt/clay could limit the use of sheet pile construction at the Site. Based on a geotechnical investigation of the general wall alignment completed in 2000, these unfavorable conditions are not expected to be encountered. The results of the geotechnical investigation are provided in the *Barrier Wall Focused Technology Evaluation*.

Construction of a slurry wall may generate as much as 1,000 cubic yards of soils in excess of the amount needed to be blended with the bentonite slurry for backfill. Depending on the concentrations of contaminants in these excess soils, they may need to be managed in accordance with the soil remedy specified in the ROD

and the ROD Amendment. The remedy for contaminated soil at the Site consists of excavation to a depth of four feet bgs and off-site disposal of soil with contaminant concentrations greater than the following *Action Levels*:

Arsenic:	300 mg/kg
Pentachlorophenol:	500 mg/kg
Carcinogenic PAHs:	100 mg/kg

Soil with concentrations above these *Action Levels* will require off-site disposal as a listed hazardous waste under the Resource Conservation and Recovery Act (RCRA). Due to Landfill Disposal Restrictions, pretreatment of these soils will be required prior to placement in a RCRA landfill. Any pretreatment of the soils would be conducted off-site. The excess soils from barrier wall construction with contaminant concentrations below these *Action Levels* but posing an unacceptable risk will be placed on site and capped along with other lesser-contaminated soils in accordance with the ROD.

The barrier wall will require Operation and Maintenance (O&M) consisting of continued groundwater monitoring, periodic inspections of the wall's integrity and maintenance of any areas that have degraded beyond acceptable limits. Well gauging for NAPL is currently being conducted on a weekly basis and groundwater sampling for chemical analysis is being conducted semi-annually. It is anticipated that these periodic activities will continue at similar frequencies and that assessments of the wall's integrity will be conducted approximately every five years. The estimated cost to perform each five-year assessment is approximately $30,000 (present value). Maintenance of the barrier wall will be required if the inspections or groundwater monitoring indicate a potential breach in the wall. The cost to repair such a breach will depend on the extent and nature of the problem and could range from a few tens of thousands of dollars to several hundred thousand dollars. Although slurry walls and sheet piles have been extensively used in general construction for many decades, their use at NAPL-contaminated sites is relatively recent and their reliability beyond 20 or 30 years has been unproven. Given this limited history, the functional life of the barrier wall is assumed to be 30 years, at which time it may need to be replaced.

Barrier Wall Cost

The total capital cost associated with the barrier wall is estimated to be $3,948,000. Approximately $3,180,000 is estimated for direct capital costs consisting of monitoring well abandonment, contractor mobilization/demobilization, slurry/sheet pile construction, a contingency for off-site treatment and disposal of excess soil and a 20% general construction contingency. Approximately $768,000 is estimated for indirect capital costs consisting of treatability studies, performance bonds, engineering and design, license/utility connection/ costs, contractor reporting requirements, and construction oversight. Table 1 provides a breakdown of the cost estimate.

Applicable or Relevant and Appropriate Requirements (ARARs)

Cleanup or remedial actions must comply with applicable or relevant and appropriate requirements (ARARs) under Federal environmental laws and State environmental or facility siting laws. Identification of ARARs must be done on a site-specific and action-specific basis. Although the on-site portions of cleanup activities at CERCLA sites are exempt from permitting requirements, they must meet the substantive requirements of the ARARs. The ROD provides a detailed discussion of potential ARARs for a wide range of activities at the Site. Following is a preliminary identification of the significant ARARs for the barrier wall.

Resource Conservation and Recovery Act: The Resource Conservation and Recovery Act (RCRA) is applicable to hazardous waste sent off-site or managed on-site outside an Area of Contamination (AOC).

RCRA requires that soil containing a hazardous waste be managed as a hazardous waste in accordance with Treatment, Storage and Disposal (TSD) facility requirements (40 CFR 260 et seq.). However, these requirements do not apply to remediation wastes that are managed within an Area of Contamination (AOC). EPA's policy on AOC was recently summarized in the EPA Memorandum titled Management of Remediation Waste Under RCRA, Publication No. EP530-F-98-026, October 14, 1998. "In what is typically referred to as the area of contamination (AOC) policy, EPA interprets RCRA to allow certain discrete areas of generally dispersed contamination to be considered RCRA units (usually landfills). Because an AOC is equated to a RCRA land-based unit, consolidation and in situ treatment of hazardous waste within the AOC do not create a new point of hazardous waste generation for the purposes of RCRA. This interpretation allows wastes to be consolidated or treated in situ within an AOC without triggering land disposal restrictions or minimum technology requirements. The AOC interpretation may be applied to any hazardous remediation waste (including non-media wastes) that is in or on the land." The 1996 ROD established an AOC encompassing the entire McCormick and Baxter Site. This AOC provision allows contaminated soil to be excavated and consolidated anywhere within the McCormick & Baxter Site (but not in a separate unit such as a tank) without the activity constituting a new placement of the soil that would cause the soil to become regulated as a hazardous wastes (46 FR 8758). Therefore, excavation, consolidation, stockpiling, and sorting of soil and debris during construction of the barrier wall will not be subject to the Treatment, Storage and Disposal (TSD) facility requirements of RCRA as promulgated in CFR Part 264. However, any soil transported off site would need to comply with CFR Part 264. This ARAR is unchanged from the ROD.

Endangered Species Act: The Endangered Species Act (ESA) is applicable to the barrier wall construction. The ESA requires Federal agencies to consult or confer with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS), prior to taking a Federal action. Consultation may occur when there is discretionary Federal involvement or control over the action, whether apparent (issuance of a new Federal permit), or less direct (State operation of a program with Federal oversight) (50 CFR §402.02; 50 CFR §402.10). The EPA, as the Federal action agency for the McCormick & Baxter Site, must determine whether a threatened or endangered species, or its critical habitat, will be affected by a proposed action. The ESA was identified as an ARAR in the 1996 ROD. Although no aquatic species were listed as threatened or endangered at that time, several anadromous fish species and associated critical habitat have since been listed as threatened.

The Federal listed species that fall within the action area of the McCormick & Baxter Site are:

- Lower Columbia River Chinook Salmon (Oncorhynchus tshawytscha)
- Upper Willamette River Chinook Salmon (Oncorhynchus tshawytscha)
- Lower Columbia River Steelhead (Oncorhynchus mykiss)
- Upper Willamette River Steelhead (Oncorhynchus mykiss)
- Columbia River Chum Salmon (Oncorhynchus keta)
- Bald Eagle (Haliaeetus leucocephalus)
- Golden Paintbrush (Castilleja levisecta)
- Water Howellia (Howellia aquatilis)
- Bradshaw’s lomatium (Lomatium bradshawii)
- Nelson’s checker-mallow (Sidalcea nelsoniana)
- Willamette daisy (Erigeron decumbens var. decumbens)
- Kincaid’s lupine (Lupinus sulphureus var. kincaidii)

EPA prepared a Biological Assessment (BA) to evaluate the potential effects of the barrier wall on threatened or endangered species listed above. EPA concluded that the barrier wall “may effect, likely to adversely affect” Chinook salmon, steelhead salmon and chum salmon and “will not jeopardize” sea-run cutthroat trout

and coho salmon which are candidate species for listing. The BA identifies reasonable and prudent measures which will be taken to minimize impacts to the protected species during construction activities. EPA initiated formal consultation with NMFS on the barrier wall BA on June 12, 2002, which is expected to be concluded with NMFS' issuance of a Biological Opinion.

EPA also concluded the barrier wall would either not adversely affect, have no effect or not jeopardize the remaining species listed above. The USFWS concurred with this determination in a letter dated July 11, 2002, and the USFWS noted that they have since withdrawn their proposal for listing cutthroat trout as endangered in the vicinity of the site.

The National Historic Preservation Act - Protection of Historic Properties: The National Historic Preservation Act (NHPA) is applicable to the barrier wall construction. The NHPA requires Federal agencies to take into account the effects of Federal undertakings on any historic properties listed on, or eligible for inclusion on, the National Register of Historic Places, and to avoid, minimize or mitigate any adverse effects on such properties (16 U.S.C.§ 470). The EPA, as the Federal action agency for the McCormick & Baxter Site, has a responsibility to determine whether CERCLA remedial actions could effect historic or cultural properties. EPA will identify any Indian tribes that might attach religious and cultural significance to the project area and invite them to be consulting parties. The goal of the consultation is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigation and adverse effects on historic properties. Consultation also will respect tribal sovereignty and the government-to-government relationship between the Federal government and Indian tribes. EPA is required to provide a reasonable opportunity for the Advisory Council on Historic Preservation (ACHP) to comment on the action. The State Historic Preservation Office (SHPO) typically assists ACHP with their review and comment on the proposed action. The NHPA is an action-specific ARAR that was not identified as an ARAR in the 1996 ROD.

Executive Order 11988 – Floodplain Management: Executive Order (EO) 11988 is relevant and appropriate to the barrier wall. EO 11988 requires Federal agencies carrying out their responsibilities to take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains. The barrier wall will be located at or above the ordinary high-water mark for the Willamette River and therefore will avoid impacts on the floodplain.

Greenway Regulations, City of Portland Office of Planning and Development Review, and Oregon Removal-Fill Law: The City of Portland greenway regulations fall under the NCP definition of "to be considered" (TBCs). These greenway regulations are in effect along the riparian zone of the Lower Willamette River to protect, conserve, enhance, and maintain the natural, scenic, historic, economic, and recreational qualities of lands along Portland's rivers. DEQ and EPA will coordinate with the City of Portland to identify substantive aspects of the Greenway Regulations which may be relevant to the barrier wall. These TBCs remain unchanged from the ROD.

Expected Outcomes Following Implementation of the Barrier Wall Contingency Remedy

The installation of the barrier wall is expected to meet the groundwater RAO of "minimizing NAPL discharges to the Willamette River beach and adjacent sediment to protect human health and the environment." The barrier wall will cut off the upgradient source of mobile NAPL at the Site and will prevent NAPL migration from the TFA and the FWDA toward the river. This effect should occur immediately following construction. However, the barrier wall will not contain the "wedge" of mobile NAPL that is present along the shoreline below the ordinary high-water mark of the river. It is expected that continued NAPL seepage from this "wedge" will continue for a short period of time following installation of the barrier wall. The barrier wall is

expected to reduce the hydraulic head on NAPL within this "wedge", thus slowing the rate of NAPL discharge to the river. It is not possible to accurately estimate the volume of mobile NAPL residing outside the barrier wall. However, based on the NAPL distribution within the current network of monitoring wells, DEQ and EPA expect that the vast majority of mobile NAPL will be contained within the barrier wall.

In an attempt to minimize the size of this "wedge", the barrier wall will be located as close as possible to the river while staying above the ordinary high-water mark. The barrier wall also will be located as close as possible to Willamette Cove and the City of Portland high pressure sewer main between Willamette Cove and the FWDA.

Installation of the barrier wall is expected to retard but not completely prevent the vertical migration of NAPL to the deep groundwater aquifer. The barrier wall segment directly downgradient of the TFA will partially contain DNAPL because the bottom of the barrier wall will be tied into the existing confining unit at approximately -38 feet MSL. The containment is only partial because the DNAPL could migrate horizontally along the confining unit toward the FWDA. Because of the lack of a suitable continuous, confining unit in the FWDA, the barrier wall in this area of the site will have a limited effect on the ability of DNAPL to migrate downward to the deep aquifer. However, the barrier wall is expected to effectively block the migration of DNAPL toward the river because the barrier wall in the FWDA will be constructed to a depth which is below the river bottom for a distance of 400 feet and to a depth approximately equal to the river bottom for an additional 300 feet.

Groundwater modeling was conducted to determine the effects of the barrier wall on the aquifer during wet and dry times of the year, including a 100-year flood event similar to the winter of 1996. The modeling is presented in the *Draft Groundwater Modeling Report* (August 2001). Modeling for a fully encompassing barrier wall indicated that a stable water table with an accompanying small rise in head elevation would develop within the barrier wall and that groundwater extraction would not be needed to prevent the encircled groundwater from overflowing the barrier wall.

The barrier wall is expected to facilitate the groundwater remedy in meeting the RAO of "removing mobile NAPL to the extent practicable to reduce the continuing source of groundwater contamination and potential for discharge to the Willamette River." The barrier wall will contain and prevent substantial volumes of mobile NAPL from being released to the river sediments, and may create conditions (i.e., pools of NAPL behind the wall) which will facilitate NAPL recovery. The barrier wall also is expected to decrease the potential for adverse impacts to the river by reducing the quantity of groundwater passing through the primary NAPL source areas and discharging into the river.

Additional Measures to be Performed Following Construction of the Barrier Wall

Monitoring

DEQ and EPA will monitor the hydraulic and contaminant response to the barrier wall in order to assess the overall performance of the groundwater remedy. DEQ and EPA also will monitor NAPL thickness within the wall and the NAPL seep areas. New monitoring wells will be installed both inside and outside the barrier wall to measure NAPL thickness, contaminant concentration and hydraulic head. Monitoring results will be used to verify the primary assumptions used in developing the groundwater model (see *Draft Groundwater Modeling Report* (August 2001)) and to assess the performance of the barrier wall in achieving the groundwater cleanup objectives specified in the ROD.

Continued NAPL Recovery

Enhanced NAPL recovery with off-site NAPL treatment/disposal, as specified in the ROD, will continue following construction of the barrier wall. This component of the groundwater remedy is intended to satisfy the CERCLA preference for treatment to reduce toxicity, mobility and volume of hazardous substances, and to eventually eliminate the long-term threat which mobile NAPL poses to the Willamette River. NAPL recovery is currently being conducted using manual LNAPL skimmers in select monitoring wells and manual LNAPL and DNAPL skimmers using pneumatic pumps. The NAPL recovery system will be evaluated for enhancement opportunities following construction of the barrier. These enhancements likely will include installation of new recovery wells in areas where NAPL accumulates.

Re-evaluation of Surface Water Protection Goals

National Oceanic and Atmospheric Administration (NOAA), NMFS and the Confederated Tribes of Grand Ronde, in written comments on the preliminary barrier wall proposal, stated that the ACLs may be set too high to be protective of ecological receptors in the Willamette River. To address this concern, DEQ and EPA will re-evaluate the surface water protection criteria specified in the ROD. This re-evaluation will determine whether the current groundwater ACLs are still adequate to protect human health and ecological receptors from exposure to groundwater discharging into the Willamette River. Ecological receptors of particular interest are salmon and steelhead which were recently listed as threatened under the Endangered Species Act. New surface water protection goals will be developed if it is determined that existing goals are not protective.

Evaluation of Pilot Testing of Innovative Technologies for NAPL Recovery

The ROD specifies that pilot testing shall be conducted for innovative technologies which increase the effectiveness and rate of NAPL removal. This provision of the groundwater remedy has not yet been implemented because NAPL accumulations on site appear to be decreasing based on the NAPL monitoring/extraction program and there are concerns that, in the absence of containment, the pilot tests could mobilize NAPL resulting in increased discharge to the Willamette River. The evaluation of pilot testing of innovative groundwater technologies at McCormick & Baxter will be considered after the barrier wall has been implemented and NAPL discharge is contained.

Consideration of Impermeable or Semi-permeable Soil Cap

DEQ and EPA will consider the use of impermeable or semi-permeable features in the soil cap during its' design. NOAA and NMFS have recommended the site cap be impermeable to minimize infiltration and the quantity of groundwater potentially flowing through the primary source areas. The ROD provided for construction of a soil cap on the site; however, an impermeable soil cap was not considered necessary to be protective of groundwater. Groundwater data obtained following construction of the barrier wall will be assessed to determine whether additional measures would be appropriate to minimize surface water infiltration into the NAPL source areas contained within the fully encompassing barrier wall.

V. HIGHLIGHTS OF COMMUNITY PARTICIPATION

DEQ and EPA have met with local governments and several neighborhood associations in the site vicinity to discuss cleanup efforts at the Site and present the proposed barrier wall. Additionally, the barrier wall proposal was provided for review to the following native American tribal governments and natural resource trustees:

- Confederated Tribes of Grand Ronde
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes and Bands of the Yakama Nation

- Nez Perce Tribe
- Confederated Tribes of Siletz Indians
- Confederated Tribes of the Warm Springs Reservation
- National Oceanic and Atmospheric Administration (NOAA)
- National Marine Fisheries Service (NMFS)
- U.S. Fish and Wildlife Service (FWS)

NOAA, NMFS and the Confederated Tribes of Grand Ronde provided written comments on the barrier wall. EPA and DEQ held several discussions with these parties to clarify concerns and provide preliminary responses to the comments. The outcome of these consultations is reflected in this ESD by the barrier wall design as well as the additional measures to be performed following construction of the barrier wall.

In accordance with the NCP, Section 300.435(c)(2)(i)(B), when this ESD is issued a public notice of its availability will be published in the Oregon Secretary of State's Bulletin and *The Oregonian* newspaper. In addition, a copy of the public notice will be mailed to the McCormick & Baxter Site mailing list of approximately 1000 individuals. The Administrative Record, including this ESD, will be available for public review at the two information repositories for the Site listed above.

VI. STATUTORY DETERMINATIONS

This ESD changes a component of the remedy selected in the 1996 ROD by implementing the contingency subsurface barrier wall. The remedy continues to satisfy the provisions of Section 121 of CERCLA, 42 USC §9621 and the Oregon Revised Statutes (ORS) 465.315. DEQ and EPA believe the remedy is protective of human health and the environment, attains Federal and State requirements that are legally applicable or relevant and appropriate for this remedial action, is cost effective and continues to utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy also continues to satisfy the statutory preference for treatment that reduces toxicity, mobility and volume of hazardous substances as a principal element. As provided in the ROD, reviews will the conducted every five years to ensure that the remedy continues to provide adequate protection of human health and the environment. The next Five-Year Review is scheduled for 2006.

Table 1 – Cost Estimate Breakdown for Barrier Wall

Item Description	Quantity	Unit	Cost/Unit	Factor [1]	Cost [2]
Direct Capital Costs					
Monitoring Well Abandonment [3]	1	lump sum	$10,000	1	$10,000
Wall Contractor Mobilization/Demobilization	1	lump sum	$200,000	1	$200,000
Slurry Wall Construction [4]	149,825	square feet	$7.31	1	$1,095,000
Sheet Pile Wall Construction [4, 5]	83,008	square feet	$15.00	1	$1,245,000
Contingency for Waste Soil Disposal	1	lump sum	$100,000	1	$100,000
Subtotal direct Capital costs					$2,650,000
Contingency Allowance (20%)					$530,000
Total Direct Capital costs					**$3,180,000**
Indirect Capital Costs					
Treatability Study	1	lump sum	$5,000	1	$5,000
Slurry Wall Performance Bond (1% of wall cost)					$32,000
Engineering and Design (3%)					$95,000
Legal Fees and License/Utility connection Costs (5%)					$159,000
Contractor Reporting Requirements (5%)					$159,000
Construction Oversight (10%)[6]					$318,000
Total Indirect Capital costs					**$768,000**
TOTAL CAPITAL COST					**$3,948,000**
Operation and Maintenance (O&M) and Periodic Costs					
Testing of Barrier Wall [7]	1	5 Years	$30,000	1	$30,000

Note:

All costs rounded to nearest $1,000.

[1] The factors represent adjustments for materials and installation for Portland, Oregon, if the costs were estimated using either R.S. Mean Building Construction Cost Data or from estimating data contained in Environmental Cost and Handling Option Solutions.

[2] Because of rounding, the amount in the "Cost" column may be slightly different from the product of the values in the "Quantity", "Cost/Unit", and "Factor" columns.

[3] Assumes 12 wells with an average depth of 50 feet would require decommissioning along the wall alignment.

[4] See "Barrier Wall Costs" Sheet, *Barrier Wall Focused Technology Evaluation*, for how unit cost was developed.

[5] Assumes contractor within Portland area and mobilization/demobilization costs are negligible.

[6] Includes preparation of site-specific construction plans, construction management, resident inspections and agency oversight.

[7] Assumes wall will be tested every 5 years.